An all-band uhf tvi filter

by D. F. RICHARDSON, G4GED*

THE filter to be described has been used very successfully in curing breakthrough on uhf tv receivers, which has been a considerable problem at the author's QTH due to the proximity of neighbouring houses. Most of the previously published designs for uhf-pass and braidbreaker filters were tried before this was developed, but none was successful. The filter is a six-section, capacitor-coupled, uhf high-pass device, its six resonators being printed on a pcb, which makes construction easy and repeatability very good.

The filter has a very sharp lf cut-off and a high degree of attenuation below television Band 4—of the order of 80 to 100dB. Also, the expected fall-off in performance around 900MHz results in useful attenuation above Band 5. Although it has so far only been "live" tested for 144 and 432MHz ssb breakthrough, a glance at the specification below shows that the filter should give even greater protection on all bands from 1·8 to 28MHz and a useful amount at 1·3GHz. Fig 2 shows the overall performance from 0 to 1,000MHz, and Fig 3 is a close-up of the attenuation around the lf cut-off frequency. To stop hf breakthrough it may be necessary to include a simple braid-breaker (ferrite-ring) in series with the uhf filter to prevent any outer-cable rf pick-up reaching the tv chassis.

Bandpass insertion loss	470-850MHz (Bands 4 and 5)	<3dB
Out of band attenuation	0-300MHz	>80dB
	432MHz	≥55dB
	1296MHz	≥25dB
Input and output impedances		nominal 75

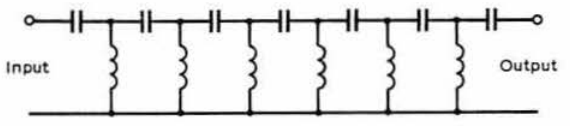

Fig 1. Six-section high-pass filter

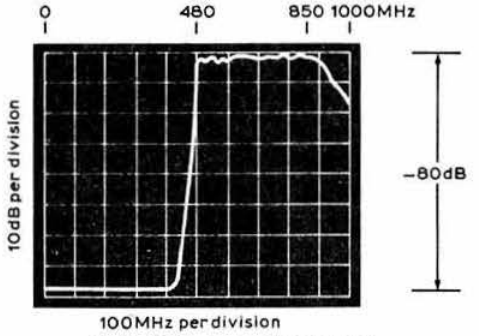

Fig 2. Performance 0-1,000MHz

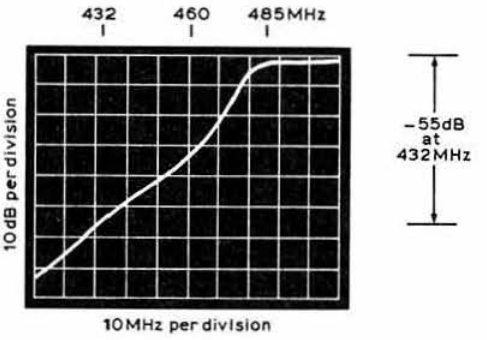

Fig 3. Performance around lf cut-off frequency

Fig 4 shows the circuit diagram, and Fig 5 the pcb actual size. The pcb is single-sided copper laminate glassfibre or srbp, and for good repeatability of the design this should be copied as accurately as possible. The dimensions of the resonators are most important as they set the lf cut-off frequency, and should be 27mm ±1mm long, and 3mm ±0·5mm wide. To put construction into perspective, all the author's pcbs (and there are four filters in "active service" at the moment) were made "on the kitchen table" with nothing more elaborate than a Dalo pen for marking.

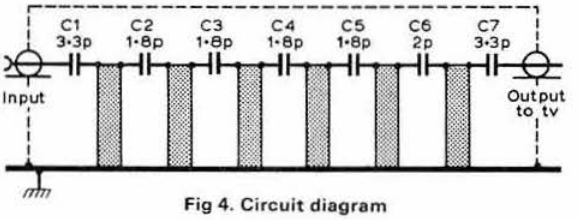

Fig 4. Circuit diagram

PCB note

The author lives in an area where the lowest tv channel is Ch23≈485MHz. Therefore, in order to give the greatest attenuation at 432MHz, the filter was optimized to have an lf cut-off at 480MHz. For use in Ch21 areas, merely lengthen the lines by reducing the ground plane by 3mm. This will place the lf cut-off at ≈465MHz, and the attenuation at 432MHz will still be between 40 and 50dB. The other out-of-band attenuation is not significantly affected. Fig 6 shows the pcb before mounting in the box, construction of which is illustrated in Fig 7.

Step by step construction

(1) Make the pcb, drill the four mounting holes (6BA) and solder on the coupling capacitors with ¼in leads as shown in Fig 6.

Capacitors

C1, C7	3·3pF	Miniature ceramic plate, tolerance ±0·25pF, ie Mullard C333 type, widely available. Soldered to pcb with leads cut to ¼in ±$\frac{1}{16}$in.
C2,3,4,5	1·8pF	
C6	2pF	Tubular "dog bone" ceramic, tolerance ±0·25pF (Erie) soldered with ⅛in, or shorter, leads.

*30 Westbury Avenue, Southall, Middlesex UB1 2UY

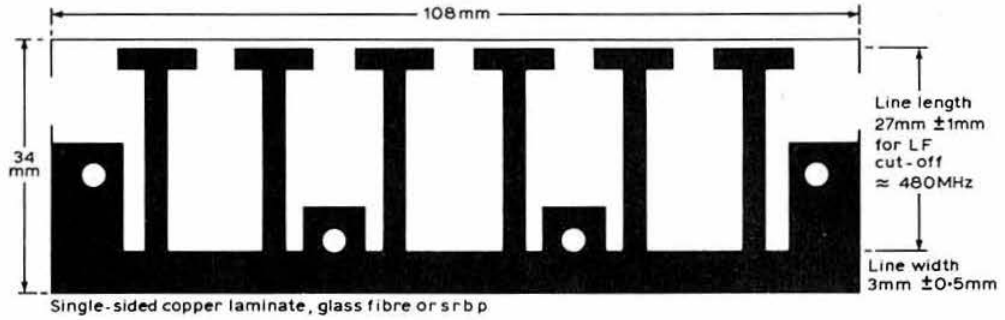
108mm
34 mm
Line length 27mm ±1mm for LF cut-off ≈ 480MHz
Line width 3mm ±0·5mm
Single-sided copper laminate, glass fibre or srbp

Fig 5. The pcb actual size

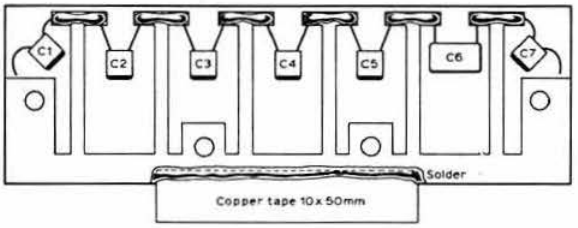

Fig 6. The pcb before mounting in box

(2) Make the box and lid.
(3) Lay the pcb on the base, *copper side up*, centralize and drill through the mounting holes.
(4) Remove the pcb and insert one $\frac{3}{8}$in 6BA bolt through each hole in the base plate, from the outside, and put two full nuts on each bolt from the inside. Tighten these up. This should provide a nominal 5mm clearance between pcb and chassis.

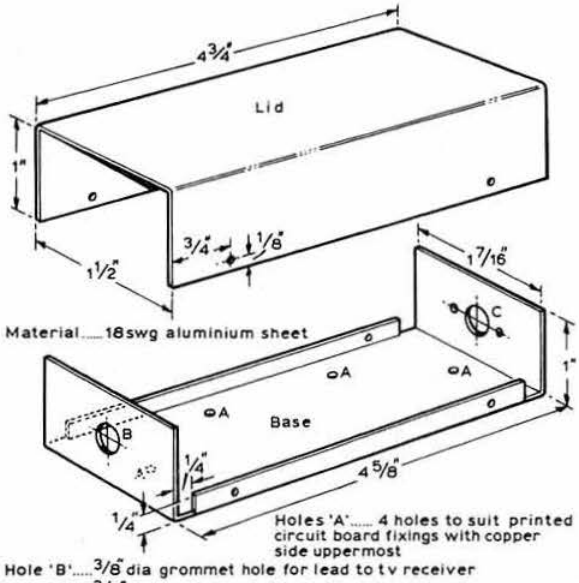

Fig 7. Box constructional details

(5) Lay the pcb, *copper side up*, over what are now four studs (the bolts) and fix each with a 6BA nut.
(6) Solder a piece of thick copper tape or braid about 10 by 50mm to the earth plane of the pcb, and bend it over the edge of the chassis so that, when the lid is put on, the tape is well trapped between the two. This ensures a good all-round earth *and is essential.*
(7) Mount a coaxial socket on one end of chassis and solder-in the input capacitor direct from the pin to the first inductor line.
(8) For the output to the television receiver, make up a short length of coaxial lead about 3 or 4in long with a coaxial plug at one end. Push the other end through a grommet in the end of the chassis, solder the braid to the earth plane, trim the inner conductor very short and solder the output capacitor direct from here to the final inductor line.
Finally screw on the lid with self-tapping screws before testing. □

NEW PRODUCT

Polar vswr bridge

A bridge designed for use with high power transmitters is now available from Polar Electronic Developments Ltd. The instrument is built round a double-sided glass fibre pcb with a printed stripline of an impedance of 50Ω. The forward and reflected power measurement is accomplished by a loosely coupled printed line with diodes at each end and with a centre-mounted cermet trimmer to enable precise calibration to be achieved. The vswr is read directly on a moving coil meter mounted on the front panel with sensitivity control and forward/reflected switch adjacent.

The technical details are: impedance 50Ω; minimum power necessary to achieve full-scale deflection 5W @ 432MHz, 10W @ 144MHz; input/output connectors, N type; maximum power levels 500W @ 432MHz, 1kW @ 144MHz; insertion loss less than 0·5dB; frequency range 5 to 500MHz. Dimensions are 6 by 3 by 3in.

The cost of this instrument is £44.90 (incl VAT). Further information can be obtained from Polar Electronic Developments, Domville Road, Liverpool L13 4AT; tel 051-220 6666. □